PATENT ABSTRACTS OF JAPAN

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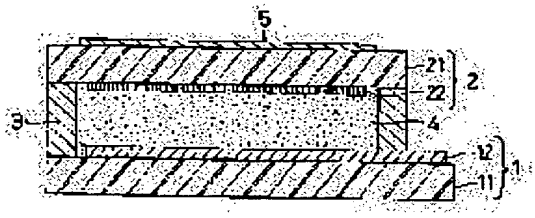
(54) REFLECTION-TYPE LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:

PURPOSE: To provide a reflection-type liq. crsytal display device capable of bright screen display, with the display defect hardly caused and excellent in reliability.

CONSTITUTION: This reflection-type liq. crystal display device is provided with a backelectrode plate 1 having a light reflecting metallic electrode 12, an electrode plate 2 on the observer side opposed to the back electrode plate and having a transparent electrode 22 and a liq. crystal substance 4 sealed between both electrode plates. The metallic electrode 12 consists of a silver-alloy thin film contg. a metal (e.g. Mg) easier to oxidize than silver. The thin film of silver alloy is firmly attached to the glass substrates 11 and 21 constituting the back electrode plate as compared with the thin film of silver alone, the alloy is hardly aggregated by heating, and the damage of the metallic electrode or its release from the substrate is prevented because of its high hardness when the display device is assembled or operated. Accordingly, the desired reflection-type liq. crystal display is provided.



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CLAIMS

[Claim(s)]

[Claim 1] An observer lateral electrode board which counters a back plate board which has a metal electrode of light reflex nature, and this back plate board, and is arranged, and has a transparent electrode, In a reflective mold liquid crystal display which is equipped with liquid crystal material enclosed among two-electrodes boards, such as this, impresses voltage between the above-mentioned metal electrode and a transparent electrode, is made to drive liquid crystal material, and carries out a screen display A reflective mold liquid crystal display characterized by consisting of thin films of a silver alloy with which a metal electrode of the above-mentioned light reflex nature contains a metal which is easy to oxidize from silver.

[Claim 2] A reflective mold liquid crystal display according to claim 1 characterized by a metal which is easy to oxidize from silver consisting of 1 or two or more kinds of metals which were chosen from magnesium, aluminum, titanium, a zirconium, and a hafnium.

[Claim 3] A reflective mold liquid crystal display according to claim 2 characterized by consisting of thin films of a silver alloy with which a metal which is easy to oxidize from silver consists of 1 or two kinds of metals which were chosen from magnesium and aluminum, and a metal electrode of light reflex nature does 0.5-30atm % content of the above-mentioned metal.

[Claim 4] A reflective mold liquid crystal display according to claim 2 characterized by consisting of thin films of a silver alloy with which a metal which is easy to oxidize from silver consists of two or more kinds of metals containing titanium or titanium, and a metal electrode of light reflex nature does 0.5-50atm % content of the above-mentioned metal.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] A screen observer starts the reflective mold liquid crystal display which has the metal electrode of light reflex nature to the back plate board located in the opposite side, and an especially bright screen display is possible for him, and it is hard to produce a display defect, and this invention relates to the reflective mold liquid crystal display which was moreover excellent in reliability.
[0002]
[Description of the Prior Art] That principal part consists of liquid-crystal material generally enclosed between the electrode board of a pair with which the electrode was arranged, and electrode boards, such as this, and a liquid crystal display controls its transparency and un-penetrating by the polarization film, and performs a screen display while it controls the plane of polarization of the light which the orientation condition of liquid crystal material is changed and penetrates this liquid crystal material by impressing voltage to the above-mentioned inter-electrode one. And as this kind of a liquid crystal display, the light source (lamp) is arranged on the rear face or the side of the above-mentioned back plate board, and the formula transparency mold liquid crystal display with a built-in lamp of the back light mold to which incidence of the light is carried out from a back plate board side, or a light guide mold has spread widely.
[0003] However, in the formula transparency mold liquid crystal display with a built-in lamp, in order that power consumption with the lamp might consume displays of other classes, such as CRT and a plasma display, and the power of an abbreviation EQC greatly, the feature of the low power of liquid crystal display original was spoiled, and it had the defect that use of the long duration in a carrying place became difficult.
[0004] On the other hand, while making it reflect by the light reflex material in which incidence of the outdoor daylight, such as indoor light and the natural light, was carried out from the electrode board (an observer lateral electrode board is called) located in the observer side of equipment, and this incident light was prepared by the above-mentioned back plate board, without building in such a lamp, the reflective mold liquid crystal display which carries out a screen display by this reflected light is also known. And in this reflective mold liquid crystal display, since a lamp is not used, power consumption has the advantage that it is small and equal to a long duration drive at a carrying place.
[0005] As such a reflective mold liquid crystal display, for example, the thing which formed the metallic reflection board a3 in the rear face of the back plate board a as shown in drawing 4 , Or although what constitutes the electrode a2 of the back plate board a from a metal thin film of light reflex nature, is made to reflect incident light with this electrode a2, and carries out a screen display is known as shown in drawing 5 Since there is a defect that the display screen constituted with the liquid crystal material c in the reflective mold liquid crystal display shown in drawing 4 is reflected in the above-mentioned metallic reflection board a3, produces an image, and is observed by the duplex, the reflective mold liquid crystal display shown in drawing 5 which does not have such a defect occupies the mainstream. In addition, b shows the observer lateral electrode board and the sealant which liquid crystal material and d unify with a polarization film, and e makes unify [c] the back plate board a and the observer lateral electrode board b by the periphery among drawing 4 - 5.
[0006]
[Problem(s) to be Solved by the Invention] By the way, as a metal electrode a2 of the light reflex nature

included in the reflective mold liquid crystal display of drawing 5 , conventionally, although it is cheap and the aluminum thin film excellent in the rate of a light reflex is used widely In order that the light reflex engine performance may fall with this oxidation that it is easy to oxidize by moisture or the base and an aluminum thin film may tend to cause a display defect with time, the silver thin film which has high resistance to moisture or a base is used as the above-mentioned metal electrode a2 in recent years.
[0007] However, also when it replaced with an aluminum thin film and a silver thin film was applied, it has the trouble as shown below and still had the room of an improvement.
[0008] First, there was a problem to which the above-mentioned silver thin film does not have good adhesion, and a silver thin film tends to exfoliate from a substrate the assembler of a liquid crystal display degree and during an equipment drive to the substrate which constitutes a back plate board, and the silver thin film had the problem which will be easy to damage if the physical force acts on the surface in the case of [like the assembler of a liquid crystal display], since the degree of hardness is not not much high.
[0009] Furthermore, the heat treatment process at the time of the assembly of a liquid crystal display (for example, the back plate board a and the observer lateral electrode board b are piled up through sealant e) The production process which carries out heating pressurization and which is united with 200-300 degrees C, Or in order to be stabilized and to carry out orientation of the liquid crystal, it had the trouble which irregularity is formed in the silver thin film surface of this condensation that it is easy to condense a silver thin film according to that heating operation spherically, and is easy to spoil that reflective engine performance at the time of the production process which heat-treats that orientation film at 200-300 degrees C.
[0010] This invention was made paying attention to such a trouble, the exfoliation or damage on a metal electrode cannot take place easily the assembler of a liquid crystal display degree, or during an equipment drive, and the place made into the technical problem continues at a long period of time, and a bright screen display is possible and it is in offering the reflective mold liquid crystal display with which a display defect cannot happen easily.
[0011]
[Means for Solving the Problem] Namely, a back plate board with which invention concerning claim 1 has a metal electrode of light reflex nature, An observer lateral electrode board which counters this back plate board, and is arranged, and has a transparent electrode, It is premised on a reflective mold liquid crystal display which is equipped with liquid crystal material enclosed among two-electrodes boards, such as this, impresses voltage between the above-mentioned metal electrode and a transparent electrode, is made to drive liquid crystal material, and carries out a screen display. A metal electrode of the above-mentioned light reflex nature is characterized by consisting of thin films of a silver alloy containing a metal which is easy to oxidize from silver.
[0012] And moreover, when a metal electrode of light reflex nature is constituted from an above-mentioned silver alloy, exfoliation and damage on the above-mentioned metal electrode stop easily a thin film of a silver alloy with which a metal which is easy to oxidize from silver was contained having good adhesion with a substrate compared with a thin film of a silver simple substance, and condensation being unable to take place easily due to a heating operation, and being able to happen, since a degree of hardness is also high an assembler of a liquid crystal display degree, and during an equipment drive.
[0013] Therefore, it becomes a bright screen display is possible and possible to offer a reflective mold liquid crystal display which was [that it is hard to produce a display defect] moreover excellent in reliability.
[0014] A metal with the high binding energy is said that it is easy to combine with an oxygen atom at silver as compared with a metal which is easy to oxidize from silver in such technical means, therefore, generally such a metal can be judged according to a metaled electron affinity (the one where an electron affinity is smaller tends to become a cation, and it is easy to combine it with an oxygen anion), electronegativity, a work function, ionization potential, etc. Moreover, since binding energy of a metal atom and an oxygen atom is high, the melting point of the metallic oxide becomes high. And a silver alloy with which such a metal was contained demonstrates strong bonding strength to a substrate with metallic-oxide metallurgy group ion

contained in this alloy at a minute amount. For example, when a substrate consists of glass, an oxygen anion, the above-mentioned metallic oxide, or a metal ion on this surface of a glass substrate joins together by strong bonding strength. For example, magnesium, aluminum, titanium, a zirconium, and a hafnium can be used, and two or more kinds of metals, such as this, may be made to contain in the above-mentioned thin film as such a metal. Invention concerning claim 2 relates to invention which specified the above-mentioned metal.

[0015] That is, invention concerning claim 2 is characterized by a metal which is easy to oxidize from silver on the assumption that a reflective mold liquid crystal display concerning invention according to claim 1 consisting of 1 or two or more kinds of metals which were chosen from from among magnesium, aluminum, titanium, a zirconium, and a hafnium.

[0016] In addition, in order to fully raise adhesion force with a substrate, it is desirable to contain the above-mentioned metal which is easy to oxidize from silver in a silver alloy which constitutes a metal electrode more than 0.5atm(s) %, and in order to prevent condensation at the time of heat treatment more certainly, containing more than 2atm(s) % is desirable. Moreover, since the resistance of the above-mentioned silver alloy falls with an increment in an addition of metals, such as this, and oxidation by moisture or base becomes easy to take place when the above-mentioned metal is magnesium, aluminum, or these both, as for the above-mentioned metal content in a silver alloy which constitutes a metal electrode, limiting to below 30atm(s) % is desirable. On the other hand, since there is a possibility that the corrosion resistance of the above-mentioned silver alloy may become high too much with an increment in an addition of metals, such as this, the etching may become difficult, and process tolerance of an electrode pattern may fall when the above-mentioned metals are two or more kinds of metals containing titanium or titanium, as for the above-mentioned metal content in a silver alloy which constitutes a metal electrode, limiting to below 50atm(s) % is desirable. Invention concerning claims 3 and 4 is made based on such a reason for technical.

[0017] Namely, invention concerning claim 3 is premised on a reflective mold liquid crystal display concerning invention according to claim 2. A metal which is easy to oxidize from silver consists of 1 or two kinds of metals which were chosen from magnesium and aluminum. A metal electrode of light reflex nature the above-mentioned metal 0.5-30atm % content and invention which is characterized by consisting of thin films of a silver alloy to carry out, and relates to claim 4 A metal which is easy to oxidize from silver on the assumption that a reflective mold liquid crystal display concerning invention according to claim 2 It consists of two or more kinds of metals containing titanium or titanium, and a metal electrode of light reflex nature is characterized for the above-mentioned metal by consisting of thin films of a silver alloy to carry out 0.5-50atm % content.

[0018] In addition, in order to raise further a degree of hardness of a metal electrode of the above-mentioned light reflex nature and to prevent with a blemish, minute amount content of other elements may be carried out into the above-mentioned silver alloy. As such an element, metallic elements, such as V, Nb, Ta, Cr, Mo, W, Mn, Fe, nickel, Co, Cu, and Zn, are mentioned, for example. Moreover, nonmetallic elements, such as Si, P, Bi, and Sb, may be added.

[0019] Next, on a substrate of a back plate board, the above-mentioned metal electrode of light reflex nature can form a thin film of a silver alloy which has the same presentation as the above-mentioned metal electrode, and can form it by carrying out patterning of the above-mentioned thin film according to a well-known FOTORISO process. And a method of using as a target a silver alloy which has the same presentation as this thin film, for example, and carrying out sputtering as a method of forming the above-mentioned thin film, or a method of making the above-mentioned silver alloy a source of vacuum evaporationo, and carrying out vacuum deposition is mentioned. Moreover, it is possible to expose both sides of silver and the above-mentioned metal on the surface partially, respectively, to consider as a target, and to form a thin film of the above-mentioned silver alloy by carrying out sputtering by arranging silver and a metal which is easy to oxidize from this by turns (for example, the shape of the shape of a stripe, and a concentric circle), or laying on silver the above-mentioned metal which is easy to oxidize from silver partially. In this case, it depends on a ratio of a silver exposure product and an exposure product of the

above-mentioned metal for a presentation of a thin film formed. Moreover, it is also possible to form membranes by ion plating.

[0020] Moreover, as a substrate which a thin film of a silver alloy is formed and constitutes a back plate board, a glass substrate is mentioned, for example. Moreover, in addition to this, application of plastic film, a plastics board, etc. is also possible. This substrate may be colored not only transparence but black, white, and other colors. In using a black thing as a substrate, it becomes possible to prevent reflection of light which carried out incidence to a part to which the above-mentioned metal electrode does not exist, and to aim at improvement in contrast of the display screen, without forming a protection-from-light film in a gap part of a pixel of a liquid crystal display, and a pixel (about pixel Mabe). Moreover, when a liquid crystal display uses it in a bright room with much indoor light, while performing a screen display using the above-mentioned indoor light, it is desirable to use a transparent substrate in the case of a reflective mold liquid crystal display of a transflective form which builds a lamp in the interior of equipment in preparation for the time of using it in a dark room which runs short of this indoor light.

[0021] Moreover, it precedes forming a thin film of a silver alloy on the above-mentioned substrate, and processing which raises adhesion force of this thin film and substrate can also be performed to the substrate surface. As such surface treatment, UV irradiation and plasma treatment are mentioned, for example. Moreover, since the above-mentioned adhesion force is raised, it precedes forming a thin film of a silver alloy, and a chromium thin film and an ITO thin film can also be formed on a substrate. And when an ITO thin film is formed, this ITO thin film is transparent, and it becomes possible [without preparing a protection-from-light layer in parts other than this pixel by carrying out patterning of the above-mentioned thin film to a rectangle-like pixel pattern, while carrying out patterning of this ITO thin film to the shape of a stripe, since it moreover has conductivity] to prevent a light reflex of this part and to raise contrast of the display screen.

[0022] On the other hand, as a substrate which constitutes an observer lateral electrode board, transparence substrates, such as a glass substrate, plastic film, and a plastics board, can be applied, and transparence electric conduction films, such as ITO and a Nesa membrane, can be applied as a transparent electrode. Moreover, it is also possible to scatter display light, to make an angle of visibility of the display screen expand, or to prepare [prepare a light-scattering layer in this observer lateral electrode board,] a color filter layer in it, and to color and carry out color display of the display light to it. A light-scattering layer may be prepared in any of the inside in contact with liquid crystal material of the above-mentioned substrate, or an outside in contact with a polarization film. As such a light-scattering layer, what distributed a particle from which this and a refractive index differ is applicable into a transparence resin binder, for example. As such a particle For example, MgF2, CaF2, LiF, NaF, BaF2, SiO2, TiO2, HfO2, MgO, CaO, aluminum 2O3, SnO2 and PbO, Sb2O5, ZrO2, non-subtlety powder of CeO2 grade, Or impalpable powder of fluororesins, such as PTFE (polytetrafluoroethylene), Amorphous polyolefine impalpable powder, a bead of the poly divinylbenzene, a hollow bead of polystyrene, the Pori Sall John impalpable powder, impalpable powder of a fused quartz, impalpable powder of fluoride content silica glass of FK-6 grade, etc. can be used. Moreover, it is also possible to split-face--ization-process the surface of the above-mentioned substrate and to use this surface instead of a light-scattering layer.

[0023] Moreover, a color filter layer by print processes which printed and formed ink containing a coloring matter in a pixel pattern as the above-mentioned color filter layer, A color filter layer by staining technique which dyed transparence resin a pixel pattern and formed it, Or a color filter layer by pigment content powder method which carried out exposure and development and which was formed in a pixel pattern according to a FOTORISO process after applying photosensitive transparence resin containing a coloring matter, A color filter layer by electrodeposition process which a pixel pattern was made to electrodeposit an electrodeposition paint containing a coloring matter, and formed it, Well-known color filter layers, such as a color filter layer by xerography which a toner containing a coloring matter was made to adhere to a pixel pattern according to a xerography, and formed it, can be used.

[0024] In addition, since electric resistance is small as compared with a transparent electrode of an observer lateral electrode board, as for a metal electrode concerning this invention, it is desirable that a

liquid crystal display uses the above-mentioned metal electrode as a scan lateral electrode in the case of a passive-matrix drive method (mainly applied when liquid crystal material or its orientation condition is STN, ECB, a HOMEOTORO pick, or antiferroelectricity liquid crystal), and uses a transparent electrode of an observer lateral electrode board for it as a signal electrode. Moreover, in the case of a thing of a active-matrix drive method equipped with driver elements (TFT etc.) which make liquid crystal material drive for every pixel, a driver element may be prepared at any of the above-mentioned back plate board and an observer lateral electrode board.

[0025]

[Function] According to invention concerning claims 1-4, the metal electrode of the light reflex nature prepared in the back plate board of a reflective mold liquid crystal display Consist of thin films of the silver alloy containing the metal which is easy to oxidize from silver, and the thin film of the above-mentioned silver alloy has good adhesion with the substrate which constitutes a back plate board compared with the thin film of a silver simple substance. And the condensation cannot take place easily due to a heating operation, and moreover, since the degree of hardness is high, it becomes possible to prevent beforehand damage and the exfoliation from a substrate of the above-mentioned metal electrode the assembler of a reflective mold liquid crystal display degree, and during an equipment drive.

[0026]

[Example] Hereafter, the example of this invention is explained to details with reference to a drawing.

[0027] [Example 1] the reflective mold liquid crystal display concerning this example The observer lateral electrode board 2 which countered the back plate board 1 and this back plate board 1, and has been arranged as shown in drawing 1 , The principal part consists of a sealant 3 which makes the two-electrodes boards 1 and 2, such as this, unify by the periphery, liquid crystal material 4 enclosed among the two-electrodes boards 1 and 2, such as this, and a polarization film 5 by which the laminating was carried out to the external surface of the above-mentioned observer lateral electrode board 2. The above-mentioned back plate board 1 on a glass substrate 11 and this glass substrate 11 with a thickness of 0.7 micrometers Moreover, width of face of 315 micrometers, It consists of metal electrodes 12 which consist of the thin film (0.2 micrometers in thickness) of the silver alloy which is prepared in a pitch 330micrometer stripe pattern, and does 4atm(s) % content of magnesium. The observer lateral electrode board 2 on a glass substrate 21 and this glass substrate 21 with a thickness of 0.7 micrometers On the other hand, width of face of 315 micrometers, It consists of transparent electrodes 22 which are prepared in a pitch 330micrometer stripe pattern (stripe pattern of the direction which intersects perpendicularly with the above-mentioned metal electrode 12), and consist of a transparence electric conduction film with a thickness of 0.24 micrometers.

[0028] And this liquid crystal display is manufactured according to the following production processes.

[0029] First, the silver alloy which does 4atm(s) % content of magnesium was used as the target, the thin film of the same presentation as this was formed by sputtering on the glass substrate 11, it was processed into the stripe pattern according to the well-known FOTORISO process, and the back plate board 1 was manufactured.

[0030] Next, after carrying out vacuum deposition of the transparence electric conduction film on the above-mentioned glass substrate 21 maintained to the room temperature and processing it into a stripe pattern according to a FOTORISO process, it heat-treated in order to increase the conductivity of pair Perilla frutescens (L.) Britton var. crispa (Thunb.) Decne. on this transparence electric conduction film, and the observer side substrate 2 was manufactured. And minded the sealant 3, the above-mentioned back plate board 1 and the observer lateral electrode board 2 were made to heat, and pressurize and unify at superposition and the temperature of 200-300 degrees C, and the above-mentioned reflective mold liquid crystal display was manufactured.

[0031] In this way, when the configuration of the metal electrode 12 of the manufactured reflective mold liquid crystal display was observed, it has checked that the exterior change was not seen and isoagglutination had not produced it as compared with the time of thin film membrane formation of a silver alloy. Moreover, it has also checked 95% being shown when the rate of a light reflex is measured, and

having the outstanding light reflex engine performance. In addition, when the existence of the silver alloy thin film which tore off after pasting up a cellophane tape on this metal electrode 12, and was torn off with exfoliation of this cellophane tape estimated the adhesion of the above-mentioned metal electrode 12 and a glass substrate 11, the silver alloy thin film torn off by adhering to the above-mentioned cellophane tape was not observed at all, but it has checked having high adhesion.

[0032] Except for the point which replaced [example of comparison] magnesium with the silver alloy thin film of which 4atm(s) % content is done, and used the thin film of a silver simple substance, the reflective mold liquid crystal display was manufactured like the example 1.

[0033] In this way, when the configuration of the metal electrode 12 of the manufactured reflective mold liquid crystal display was observed, the silver thin film which some metal electrodes 12 were destroyed and was condensed spherically was observed.

[0034] Moreover, when it tore off after pasting up a cellophane tape on this metal electrode 12, as for the above-mentioned silver thin film, all were mostly torn off with exfoliation of a cellophane tape.

[0035] Except for the point which used the thin film of the silver alloy which replaces [example 2] magnesium with the silver alloy thin film of which 4atm(s) % content is done, and contains magnesium 4atm % and titanium 1atm %, the reflective mold liquid crystal display was manufactured like the example 1.

[0036] Isoagglutination was not observed by the metal electrode of the obtained reflective mold liquid crystal display, and the high light reflex engine performance was shown. Moreover, the silver alloy thin film torn off by adhering to a cellophane tape also in the friction test using the above-mentioned Scotch tape was not observed, but it has checked having high adhesion.

[0037] [Example 3] the reflective mold liquid crystal display concerning this example The observer lateral electrode board 2 which countered the back plate board 1 and this back plate board 1, and has been arranged as shown in drawing 2 , The sealant 3 which makes the two-electrodes boards 1 and 2, such as this, unify by the periphery, and the liquid crystal material 4 enclosed among the two-electrodes boards 1 and 2, such as this, It is arranged behind the polarization film 5 by which the laminating was carried out to the external surface of the above-mentioned observer lateral electrode board 2, and the back lateral electrode board 1, and the principal part consists of lamps (not shown) used by switching on the light in the dark interior of a room of lighting. The above-mentioned back plate board 1 on a glass substrate 11 and this glass substrate 11 with a thickness of 0.7 micrometers Moreover, width of face of 195 micrometers, The ITO thin film 13 which consists of the indium oxide which is prepared in a pitch 210micrometer stripe pattern, and contains tin oxide 7.5% of the weight (0.1 micrometers in thickness), It consists of metal electrodes 14 which consist of the thin film of the silver alloy which is prepared in the pixel part on this ITO thin film 13 in the shape of a pattern (rectangle pattern whose one side which has circular hole aperture pattern of 70 micrometers of diameters 14a in the center section as shown in drawing 3 is 195 micrometers), and does 8atm(s) % content of aluminum. The observer lateral electrode board 2 on a glass substrate 21 and this glass substrate 21 with a thickness of 0.7 micrometers On the other hand, width of face of 195 micrometers, It consists of transparent electrodes 22 which are prepared in a pitch 210micrometer stripe pattern (stripe pattern of the direction which intersects perpendicularly with the above-mentioned metal electrode 14), and consist of a transparence electric conduction film with a thickness of 0.2 micrometers.

[0038] In addition, hole aperture pattern 14a prepared in the center section of the above-mentioned metal electrode 14 guides the light of the above-mentioned lamp turned on in case a liquid crystal display is driven in the dark interior of a room of lighting to a pixel part.

[0039] And this reflective mold liquid crystal display is manufactured according to the following production processes.

[0040] First, the thin film of the silver alloy which does 8atm(s) % content of the ITO thin film which consists of the indium oxide which contains tin oxide 7.5% of the weight on the glass substrate 11 maintained to the room temperature, and aluminum was formed by sputtering, after processing the above-mentioned silver alloy thin film into the above-mentioned rectangle pattern which has a hole aperture pattern according to a well-known FOTORISO process, the above-mentioned ITO thin film was processed

into the above-mentioned stripe pattern, and the back plate board 1 was manufactured.
[0041] Next, after carrying out vacuum deposition of the transparence electric conduction film on the above-mentioned glass substrate 21 maintained to the room temperature and processing it into the above-mentioned stripe pattern according to a FOTORISO process, it heat-treated in order to increase the conductivity of pair Perilla frutescens (L.) Britton var. crispa (Thunb.) Decne. on this transparence electric conduction film, and the observer side substrate 2 was manufactured. And minded the sealant 3, the above-mentioned back plate board 1 and the observer lateral electrode board 2 were made to heat, and pressurize and unify at superposition and the temperature of 200-300 degrees C, and the above-mentioned reflective mold liquid crystal display was manufactured.
[0042] Isoagglutination was not observed by the metal electrode 14 of the obtained reflective mold liquid crystal display, and the high light reflex engine performance was shown. Moreover, the silver alloy thin film torn off by adhering to a cellophane tape also in the friction test using the above-mentioned Scotch tape was not observed, but it has checked having high adhesion.
[0043]
[Effect of the Invention] According to invention concerning claims 1-4, the metal electrode of the light reflex nature prepared in the back plate board of a reflective mold liquid crystal display Consist of thin films of the silver alloy containing the metal which is easy to oxidize from silver, and the thin film of the above-mentioned silver alloy has good adhesion with the substrate which constitutes a back plate board compared with the thin film of a silver simple substance. And the condensation cannot take place easily due to a heating operation, and moreover, since the degree of hardness is high, it becomes possible to prevent beforehand damage and the exfoliation from a substrate of the above-mentioned metal electrode the assembler of a reflective mold liquid crystal display degree, and during an equipment drive.
[0044] Therefore, it has the effect that the reflective mold liquid crystal display which was [that a bright screen display is possible and it is hard to produce a display defect] moreover excellent in reliability can be offered.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The cross section of the reflective mold liquid crystal display concerning an example 1.
[Drawing 2] The cross section of the reflective mold liquid crystal display concerning an example 3.
[Drawing 3] The important section plan showing the pattern of the metal electrode concerning an example 3.
[Drawing 4] The cross section of the reflective mold liquid crystal display concerning the conventional example.
[Drawing 5] The cross section of the reflective mold liquid crystal display concerning the conventional example.
[Description of Notations]
1 Back Plate Board
2 Observer Lateral Electrode Board
3 Sealant
4 Liquid Crystal Material
5 Polarization Film
11 Glass Substrate
12 Metal Electrode
21 Glass Substrate
22 Transparent Electrode

[Translation done.]

(19)日本国特許庁（ＪＰ）　(12) **公開特許公報（Ａ）**　(11)特許出願公開番号

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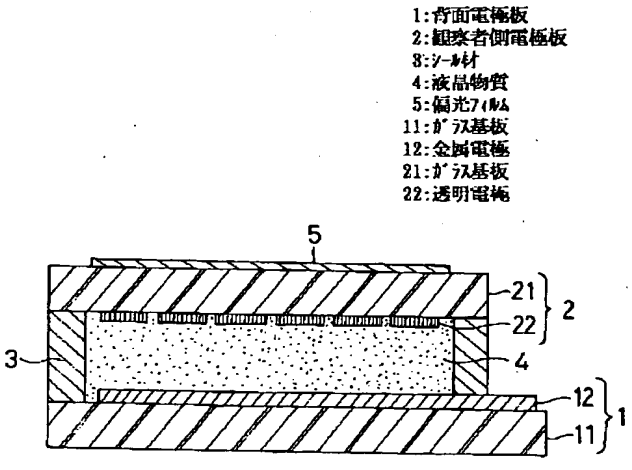
(54)【発明の名称】　反射型液晶表示装置

(57)【要約】

【目的】　明るい画面表示が可能で、表示欠陥が生じ難く、信頼性に優れた反射型液晶表示装置を提供すること。

【構成】　光反射性の金属電極12を有する背面電極板１と、この背面電極板に対向して配置されかつ透明電極22ををを有する観察者側電極板２と、これ等両電極板間に封入された液晶物質４とを備える反射型液晶表示装置であって、上記金属電極12が銀より酸化され易い金属（例えばＭｇ）を含有する銀合金薄膜から成ることを特徴とする。そして、上記銀合金の薄膜は銀単体の薄膜に較べて背面電極板を構成するガラス基板との密着性が良好で、かつ加熱作用によりその凝集が起こり難く、しかも硬度が高いため反射型液晶表示装置の組み立て工程や装置駆動中において金属電極の損傷や基板からの剥離を未然に防止することが可能となる。従って、目的とする上記反射型液晶表示装置を提供できる。



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【特許請求の範囲】

【請求項１】光反射性の金属電極を有する背面電極板と、この背面電極板に対向して配置されかつ透明電極を有する観察者側電極板と、これ等両電極板間に封入された液晶物質とを備え、上記金属電極と透明電極との間に電圧を印加して液晶物質を駆動させ画面表示する反射型液晶表示装置において、

上記光反射性の金属電極が、銀より酸化され易い金属を含有する銀合金の薄膜にて構成されていることを特徴とする反射型液晶表示装置。

【請求項２】銀より酸化され易い金属が、マグネシウム、アルミニウム、チタン、ジルコニウム及びハフニウムから選択された一又は二種類以上の金属から成ることを特徴とする請求項１に記載の反射型液晶表示装置。

【請求項３】銀より酸化され易い金属が、マグネシウム及びアルミニウムから選択された一又は二種類の金属から成り、かつ、光反射性の金属電極が上記金属を０．５～３０atm %含有する銀合金の薄膜にて構成されていることを特徴とする請求項２に記載の反射型液晶表示装置。

【請求項４】銀より酸化され易い金属が、チタン又はチタンを含む二種類以上の金属から成り、光反射性の金属電極が上記金属を０．５～５０atm %含有する銀合金の薄膜にて構成されていることを特徴とする請求項２に記載の反射型液晶表示装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、画面観察者とは反対側に位置する背面電極板に光反射性の金属電極を有する反射型液晶表示装置に係り、特に明るい画面表示が可能でかつ表示欠陥が生じ難く、しかも信頼性に優れた反射型液晶表示装置に関するものである。

【０００２】

【従来の技術】液晶表示装置は、一般に、電極が配設された一対の電極板と、これ等電極板間に封入された液晶物質とでその主要部が構成され、上記電極間に電圧を印加することにより液晶物質の配向状態を変化させてこの液晶物質を透過する光の偏光面を制御すると共に、偏光フィルムによりその透過・不透過を制御して画面表示を行うものである。そして、この種の液晶表示装置としては、上記背面電極板の裏面若しくは側面に光源（ランプ）を配置し、背面電極板側から光線を入射させるバックライト型あるいはライトガイド型のランプ内蔵式透過型液晶表示装置が広く普及している。

【０００３】しかし、ランプ内蔵式透過型液晶表示装置においては、そのランプによる消費電力が大きくＣＲＴやプラズマディスプレイ等他の種類のディスプレイと略同等の電力を消費するため、液晶表示装置本来の低消費電力といった特徴を損ない、また、携帯先での長時間の利用が困難となるという欠点を有していた。

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【０００４】他方、このようなランプを内蔵することなく、装置の観察者側に位置する電極板（観察者側電極板と称する）から室内光や自然光等の外光を入射させ、かつ、この入射光を上記背面電極板に設けられた光反射材で反射させると共に、この反射光で画面表示する反射型液晶表示装置も知られている。そして、この反射型液晶表示装置ではランプを利用しないことから消費電力が小さく、携帯先での長時間駆動に耐えるという利点を有している。

【０００５】このような反射型液晶表示装置として、例えば、図４に示すように背面電極板ａの裏面に金属反射板ａ３を設けたもの、あるいは、図５に示すように背面電極板ａの電極ａ２を光反射性の金属薄膜で構成しこの電極ａ２により入射光を反射させて画面表示するもの等が知られているが、図４に示された反射型液晶表示装置においては液晶物質ｃによって構成された表示画面が上記金属反射板ａ３に映って虚像を生じ二重に観察されるという欠点があるため、このような欠点を有さない図５に示された反射型液晶表示装置が主流を占めている。

尚、図４～５中、ｂは観察者側電極板、ｃは液晶物質、ｄは偏光フィルム、ｅは背面電極板ａと観察者側電極板ｂとを周辺部で一体化させるシール材を示している。

【０００６】

【発明が解決しようとする課題】ところで、図５の反射型液晶表示装置に組込まれる光反射性の金属電極ａ２としては、従来、安価で光反射率に優れたアルミニウム薄膜が広く利用されているが、アルミニウム薄膜は水分や塩基により酸化され易くこの酸化に伴い光反射性能が低下して経時的に表示欠陥を引起こし易いため、近年、水分や塩基に対し高い耐性を有する銀薄膜が上記金属電極ａ２として利用されている。

【０００７】しかし、アルミニウム薄膜に代えて銀薄膜を適用した場合にも以下に示すような問題点を有しており未だ改善の余地を有していた。

【０００８】まず、背面電極板を構成する基板に対して上記銀薄膜は密着性が良好でなく、液晶表示装置の組み立て工程や装置駆動中において銀薄膜が基板から剥離し易い問題があり、かつ、銀薄膜は硬度が余り高くないため液晶表示装置の組み立て工程の際にその表面に物理的な力が作用すると損傷され易い問題があった。

【０００９】更に、液晶表示装置の組立て時における熱処理工程（例えば、背面電極板ａと観察者側電極板ｂとをシール材ｅを介して重ね合わせ、２００～３００℃に加熱加圧して一体化する工程、あるいは、液晶を安定して配向させるためその配向膜を２００～３００℃で熱処理する工程）の際、その加熱作用により銀薄膜が球状に凝集し易くこの凝集により銀薄膜表面に凹凸が形成されてその反射性能を損ない易い問題点を有していた。

【００１０】本発明はこのような問題点に着目してなされたもので、その課題とするところは、液晶表示装置の

組み立て工程や装置駆動中において金属電極の剥離や損傷が起こり難く、長期に亘って明るい画面表示が可能でかつ表示欠陥が起こり難い反射型液晶表示装置を提供することにある。

【００１１】

【課題を解決するための手段】すなわち、請求項１に係る発明は、光反射性の金属電極を有する背面電極板と、この背面電極板に対向して配置されかつ透明電極を有する観察者側電極板と、これ等両電極板間に封入された液晶物質とを備え、上記金属電極と透明電極との間に電圧を印加して液晶物質を駆動させ画面表示する反射型液晶表示装置を前提とし、上記光反射性の金属電極が、銀より酸化され易い金属を含有する銀合金の薄膜にて構成されていることを特徴とするものである。

【００１２】そして、銀より酸化され易い金属が含まれた銀合金の薄膜は、銀単体の薄膜に較べて基板との密着性が良好で、かつ、加熱作用により凝集が起こり難く、しかも硬度も高いため、光反射性の金属電極を上記銀合金で構成した場合、液晶表示装置の組み立て工程や装置駆動中において上記金属電極の剥離や損傷が起こり難くなる。

【００１３】従って、明るい画面表示が可能でかつ表示欠陥が生じ難くしかも信頼性に優れた反射型液晶表示装置を提供することが可能となる。

【００１４】このような技術的手段において銀より酸化され易い金属とは、銀に比較して酸素原子と結合し易くその結合エネルギーが高い金属をいい、従ってこのような金属は、一般に、金属の電子親和力（電子親和力がより小さい方がカチオンになり易く、酸素アニオンと結合し易い）、電気陰性度、仕事関数、イオン化ポテンシャル等によって判断できる。また、金属原子と酸素原子との結合エネルギーが高いためその金属酸化物の融点が高くなる。そして、このような金属が含まれた銀合金は、この合金中に微量に含まれる金属酸化物や金属イオンによって基板に対し強い結合力を発揮する。例えば、基板がガラスから成る場合には、このガラス基板表面の酸素アニオンと上記金属酸化物又は金属イオンが強い結合力で結合する。このような金属としては、例えば、マグネシウム、アルミニウム、チタン、ジルコニウム、及び、ハフニウムが使用でき、かつ、これ等金属の二種類以上を上記薄膜中に含有させてもよい。請求項２に係る発明は上記金属を特定した発明に関する。

【００１５】すなわち、請求項２に係る発明は、請求項１記載の発明に係る反射型液晶表示装置を前提とし、銀より酸化され易い金属が、マグネシウム、アルミニウム、チタン、ジルコニウム及びハフニウムの内から選択された一又は二種類以上の金属から成ることを特徴とするものである。

【００１６】尚、基板との密着力を十分に向上させるためには金属電極を構成する銀合金中に銀より酸化され易い上記金属を０．５atm ％以上含有することが好ましく、また、熱処理時における凝集をより確実に防止するためには２atm ％以上含有することが望ましい。また、上記金属がマグネシウム、アルミニウム、又はこの両者である場合には、これ等金属の添加量の増加に伴い上記銀合金の耐性が低下して水分や塩基による酸化が起こり易くなるため、金属電極を構成する銀合金中の上記金属含有率は３０atm ％以下にとどめることが望ましい。他方、上記金属がチタン又はチタンを含む二種類以上の金属である場合には、これ等金属の添加量の増加に伴い上記銀合金の耐食性が高くなり過ぎてそのエッチングが困難となり、電極パターンの加工精度が低下する恐れがあるため、金属電極を構成する銀合金中の上記金属含有率は５０atm ％以下にとどめることが望ましい。請求項３及び４に係る発明はこのような技術的理由に基づいてなされたものである。

【００１７】すなわち、請求項３に係る発明は、請求項２記載の発明に係る反射型液晶表示装置を前提とし、銀より酸化され易い金属が、マグネシウム及びアルミニウムから選択された一又は二種類の金属から成り、かつ、光反射性の金属電極が上記金属を０．５～３０atm ％含有する銀合金の薄膜にて構成されることを特徴とするものであり、また、請求項４に係る発明は、請求項２記載の発明に係る反射型液晶表示装置を前提とし、銀より酸化され易い金属が、チタン又はチタンを含む二種類以上の金属から成り、光反射性の金属電極が上記金属を０．５～５０atm ％含有する銀合金の薄膜にて構成されることを特徴とするものである。

【００１８】尚、上記光反射性の金属電極の硬度を更に向上させて傷付きを防止するため、上記銀合金中に他の元素を微量含有させてもよい。このような元素としては、例えば、Ｖ、Ｎｂ、Ｔａ、Ｃｒ、Ｍｏ、Ｗ、Ｍｎ、Ｆｅ、Ｎｉ、Ｃｏ、Ｃｕ、及び、Ｚｎ等の金属元素が挙げられる。また、Ｓｉ、Ｐ、Ｂｉ、Ｓｂ等の非金属元素を添加してもよい。

【００１９】次に、光反射性の上記金属電極は、背面電極板の基板上に上記金属電極と同一の組成を有する銀合金の薄膜を成膜し、周知のフォトリソプロセスに従って上記薄膜をパターニングすることにより形成することができる。そして、上記薄膜を成膜する方法としては、例えば、この薄膜と同一の組成を有する銀合金をターゲットとしてスパッタリングする方法、あるいは、上記銀合金を蒸着源として真空蒸着する方法等が挙げられる。また、銀とこれより酸化され易い金属とを交互に（例えば、ストライプ状又は同心円状）に配置したり、銀の上に部分的に銀より酸化され易い上記金属を載置したりすることにより、銀と上記金属の双方をそれぞれ部分的に表面に露出させてターゲットとしスパッタリングすることにより上記銀合金の薄膜を成膜することが可能である。この場合、成膜される薄膜の組成は銀の露出面積と

上記金属の露出面積との比に依存する。また、イオンプレーティングにより成膜することも可能である。

【００２０】また、銀合金の薄膜が成膜されかつ背面電極板を構成する基板としては、例えばガラス基板が挙げられる。また、この他、プラスチックフィルム、プラスチックボード等の適用も可能である。この基板は透明に限らず、黒色、白色、その他の色に着色したものであってもよい。基板として黒色のものを使用する場合には、液晶表示装置の画素と画素との間隙部位（画素間部位）に遮光膜を形成することなく上記金属電極が存在しない部位に入射した光線の反射を防止して表示画面のコントラストの向上を図ることが可能になる。また、液晶表示装置が、室内光の多い明るい部屋で使用するときには上記室内光を利用して画面表示を行うと共に、この室内光が不足する暗い部屋で使用するときに備えて装置内部にランプを内蔵する半透過形の反射型液晶表示装置の場合には、透明な基板を利用することが望ましい。

【００２１】また、上記基板上に銀合金の薄膜を成膜するに先立って、この薄膜と基板との密着力を向上させる処理を基板表面に施すこともできる。このような表面処理としては、例えば、紫外線照射、プラズマ処理が挙げられる。また、上記密着力を向上させるため、銀合金の薄膜を成膜するに先立って、基板上にクロム薄膜やＩＴＯ薄膜を成膜することもできる。そして、ＩＴＯ薄膜を成膜した場合には、このＩＴＯ薄膜が透明でしかも導電性を有するため、このＩＴＯ薄膜をストライプ状にパターニングすると共に上記薄膜を矩形状の画素パターンにパターニングすることにより、この画素以外の部位に遮光層を設けることなくこの部位の光反射を防止して表示画面のコントラストを向上させることが可能となる。

【００２２】他方、観察者側電極板を構成する基板としては、ガラス基板、プラスチックフィルム、プラスチックボード等の透明基板が適用でき、また、透明電極としてはＩＴＯやネサ膜等の透明導電膜が適用できる。また、この観察者側電極板に光散乱層を設けて表示光を散乱させ表示画面の視野角を拡大させたり、カラーフィルター層を設けて表示光を着色してカラー表示することも可能である。光散乱層は上記基板の液晶物質と接触する内側、あるいは偏光フィルムと接触する外側のいずれに設けてもよい。このような光散乱層としては、例えば、透明樹脂バインダー中にこれと屈折率の異なる微粒子を分散させたものが適用でき、このような微粒子としては、例えば、MgF_2、CaF_2、ＬｉＦ、ＮａＦ、BaF_2、SiO_2、TiO_2、HfO_2、ＭｇＯ、ＣａＯ、Al_2O_3、SnO_2、ＰｂＯ、Sb_2O_5、ZrO_2、CeO_2等の無機微粉末、あるいはＰＴＦＥ（ポリテトラフルオロエチレン）等のフッ素樹脂の微粉末、アモルファスポリオレフィン微粉末、ポリジビニルベンゼンのビーズ、ポリスチレンの中空ビーズ、ポリサルフォン微粉末、溶融石英の微粉末、ＦＫ－６等のフッ化物含有珪酸ガラスの微粉末等が使用できる。また、上記基板の表面を粗面化処理してこの表面を光散乱層の代わりに利用することも可能である。

【００２３】また、上記カラーフィルター層としては、着色材を含有するインキを画素パターンに印刷して形成した印刷法によるカラーフィルター層、透明樹脂を画素パターンに染色して形成した染色法によるカラーフィルター層、あるいは着色材を含有する感光性透明樹脂を塗布した後フォトリソプロセスに従って画素パターンに露光・現像して形成した顔料分散法によるカラーフィルター層、着色材を含有する電着塗料を画素パターンに電着させて形成した電着法によるカラーフィルター層、着色材を含有するトナーを電子写真法に従って画素パターンに付着させて形成した電子写真法によるカラーフィルター層等の周知のカラーフィルター層を利用することができる。

【００２４】尚、本発明に係る金属電極は観察者側電極板の透明電極に比較して電気抵抗が小さいため、液晶表示装置が単純マトリクス駆動方式（液晶物質又はその配向状態がＳＴＮ、ＥＣＢ、ホメオトロピック又は反強誘電性液晶の場合に主に適用されている）の場合には、上記金属電極を走査側電極として使用し、観察者側電極板の透明電極を信号電極として使用することが好ましい。また、画素毎に液晶物質を駆動させる駆動素子（ＴＦＴ等）を備えるアクティブマトリクス駆動方式のものの場合には、上記背面電極板と観察者側電極板のいずれに駆動素子を設けてもよい。

【００２５】

【作用】請求項１～４に係る発明によれば、反射型液晶表示装置の背面電極板に設けられる光反射性の金属電極が、銀より酸化され易い金属を含有する銀合金の薄膜にて構成されており、上記銀合金の薄膜は銀単体の薄膜に較べて背面電極板を構成する基板との密着性が良好で、かつ、加熱作用によりその凝集が起こり難く、しかも、硬度が高いため、反射型液晶表示装置の組み立て工程や装置駆動中において上記金属電極の損傷や基板からの剥離を未然に防止することが可能となる。

【００２６】

【実施例】以下、図面を参照して本発明の実施例について詳細に説明する。

【００２７】［実施例１］この実施例に係る反射型液晶表示装置は、図１に示すように背面電極板１と、この背面電極板１に対向して配置された観察者側電極板２と、これ等両電極板１、２を周辺部で一体化させるシール材３と、これ等両電極板１、２の間に封入された液晶物質４と、上記観察者側電極板２の外面に積層された偏光フィルム５とでその主要部が構成されている。また、上記背面電極板１は、厚さ０．７μｍのガラス基板１１と、このガラス基板１１上に幅３１５μｍ、ピッチ３３０μｍのストライプパターンに設けられかつマグネシウムを

4atm %含有する銀合金の薄膜（厚さ0．2μm）から成る金属電極12とで構成され、他方、観察者側電極板2は、厚さ0．7μmのガラス基板21と、このガラス基板21上に幅315μm、ピッチ330μmのストライプパターン（上記金属電極12と直交する方向のストライプパターン）に設けられかつ厚さ0．24μmの透明導電膜から成る透明電極22とで構成されている。

【0028】そして、この液晶表示装置は以下の工程により製造したものである。

【0029】まず、マグネシウムを4atm %含有する銀合金をターゲットとし、これと同じ組成の薄膜をガラス基板11上にスパッタリングにより成膜し、周知のフォトリソプロセスに従いストライプパターンに加工して背面電極板1を製造した。

【0030】次に、室温に維持した上記ガラス基板21上に透明導電膜を真空蒸着し、かつフォトリソプロセスに従ってストライプパターンに加工した後、この透明導電膜に対しその導電率を増大させるために加熱処理を施して観察者側基板2を製造した。そして、上記背面電極板1と観察者側電極板2とをシール材3を介して重ね合わせ、200～300℃の温度で加熱かつ加圧して一体化させ上記反射型液晶表示装置を製造した。

【0031】こうして製造した反射型液晶表示装置の金属電極12の形状を観察したところ、銀合金の薄膜成膜時に比較してその外観上の変化は見られず凝集現象が生じていないことが確認できた。また、その光反射率を測定したところ95%を示し、優れた光反射性能を有することも確認できた。尚、この金属電極12上にセロハンテープを接着した後引き剥がし、このセロハンテープの剥離に伴って引き剥がされた銀合金薄膜の有無により上記金属電極12とガラス基板11との密着性を評価したところ、上記セロハンテープに付着して引き剥がされた銀合金薄膜は全く観察されず、高い密着性を有していることが確認できた。

【0032】［比較例］マグネシウムを4atm %含有する銀合金薄膜に代えて銀単体の薄膜を使用した点を除き、実施例1と同様に反射型液晶表示装置を製造した。

【0033】こうして製造された反射型液晶表示装置の金属電極12の形状を観察したところ、金属電極12の一部が破壊され球状に凝集した銀薄膜が観察された。

【0034】また、この金属電極12上にセロハンテープを接着した後引き剥がしたところ、上記銀薄膜はほぼ全部がセロハンテープの剥離に伴って引き剥がされた。

【0035】［実施例2］マグネシウムを4atm %含有する銀合金薄膜に代えてマグネシウム4atm %とチタン1atm %を含有する銀合金の薄膜を使用した点を除き、実施例1と同様に反射型液晶表示装置を製造した。

【0036】得られた反射型液晶表示装置の金属電極に凝集現象は観察されず、また高い光反射性能を示した。また、上記セロテープを用いた剥離試験においてもセロハンテープに付着して引き剥がされた銀合金薄膜は観察されず、高い密着性を有することが確認できた。

【0037】［実施例3］この実施例に係る反射型液晶表示装置は、図2に示すように背面電極板1と、この背面電極板1に対向して配置された観察者側電極板2と、これ等両電極板1、2を周辺部で一体化させるシール材3と、これ等両電極板1、2の間に封入された液晶物質4と、上記観察者側電極板2の外面に積層された偏光フィルム5と、背面側電極板1の背後に配置されかつ照明の暗い室内で点灯して使用されるランプ（図示せず）とでその主要部が構成されている。また、上記背面電極板1は、厚さ0．7μmのガラス基板11と、このガラス基板11上に幅195μm、ピッチ210μmのストライプパターンに設けられかつ酸化錫を7．5重量%含有する酸化インジウムから成るITO薄膜（厚さ0．1μm）13と、このITO薄膜13上の画素部位にパターン（図3に示すように中央部に径70μmの円形の穴開きパターン14aを有する一辺が195μmの矩形パターン）状に設けられかつアルミニウムを8atm %含有する銀合金の薄膜から成る金属電極14とで構成され、他方、観察者側電極板2は、厚さ0．7μmのガラス基板21と、このガラス基板21上に幅195μm、ピッチ210μmのストライプパターン（上記金属電極14と直交する方向のストライプパターン）に設けられかつ厚さ0．2μmの透明導電膜から成る透明電極22とで構成されている。

【0038】尚、上記金属電極14の中央部に設けられた穴開きパターン14aは、照明の暗い室内で液晶表示装置を駆動する際に点灯される上記ランプの光線を画素部位に誘導するものである。

【0039】そして、この反射型液晶表示装置は以下の工程により製造したものである。

【0040】まず、室温に維持したガラス基板11上に、酸化錫を7．5重量%含有する酸化インジウムから成るITO薄膜とアルミニウムを8atm %含有する銀合金の薄膜をスパッタリングにより成膜し、周知のフォトリソプロセスに従い上記銀合金薄膜を穴開きパターンを有する上記矩形パターンに加工した後、上記ITO薄膜を上記ストライプパターンに加工して背面電極板1を製造した。

【0041】次に、室温に維持した上記ガラス基板21上に透明導電膜を真空蒸着し、フォトリソプロセスに従って上記ストライプパターンに加工した後、この透明導電膜に対しその導電率を増大させるために加熱処理を施して観察者側基板2を製造した。そして、上記背面電極板1と観察者側電極板2とをシール材3を介して重ね合わせ、200～300℃の温度で加熱かつ加圧して一体化させ上記反射型液晶表示装置を製造した。

【0042】得られた反射型液晶表示装置の金属電極14に凝集現象は観察されず、また高い光反射性能を示し

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た。また、上記セロテープを用いた剥離試験においてもセロハンテープに付着して引き剥がされた銀合金薄膜は観察されず、高い密着性を有することが確認できた。

【００４３】

【発明の効果】請求項１～４に係る発明によれば、反射型液晶表示装置の背面電極板に設けられる光反射性の金属電極が、銀より酸化され易い金属を含有する銀合金の薄膜にて構成されており、上記銀合金の薄膜は銀単体の薄膜に較べて背面電極板を構成する基板との密着性が良好で、かつ、加熱作用によりその凝集が起こり難く、しかも、硬度が高いため、反射型液晶表示装置の組み立て工程や装置駆動中において上記金属電極の損傷や基板からの剥離を未然に防止することが可能となる。

【００４４】従って、明るい画面表示が可能でかつ表示欠陥が生じ難くしかも信頼性に優れた反射型液晶表示装置を提供できる効果を有している。

【図面の簡単な説明】

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【図１】実施例１に係る反射型液晶表示装置の断面図。

【図２】実施例３に係る反射型液晶表示装置の断面図。

【図３】実施例３に係る金属電極のパターンを示す要部平面図。

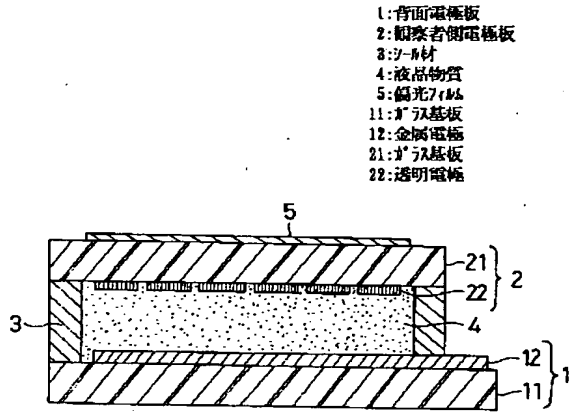
【図４】従来例に係る反射型液晶表示装置の断面図。

【図５】従来例に係る反射型液晶表示装置の断面図。

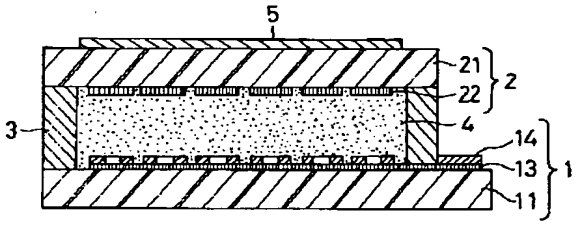
【符号の説明】

１　背面電極板
２　観察者側電極板
３　シール材
４　液晶物質
５　偏光フィルム
１１　ガラス基板
１２　金属電極
２１　ガラス基板
２２　透明電極

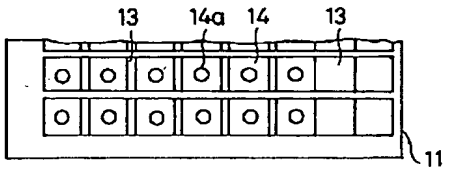
【図１】



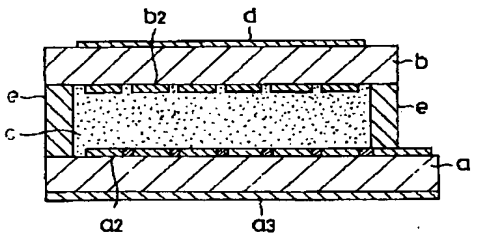
【図２】



【図３】



【図４】



【図５】